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ON THE TIME OF SEGREGATION OF GENETIC FACTORS IN PLANTS

IN *Œnothera lamarckiana,* Geerts (3) has observed that two microspores of each tetrad abort. From the results of reciprocal crosses, De Vries (9) concluded that there was a segregation of genetic factors between the aborted and unaborted pollen-grains. In my crosses of *Stizolobium* species (2), half of the pollen-grains abort in a random manner in the anthers of the F_1 hybrids; and I can only explain the results of the breeding work on the hypothesis that there is a segregation between the four microspores of each tetrad. Hence I conclude that the segregation does not take place before the cell-divisions which form the pollen-mother-cells, but takes place in the divisions which form the microspores. In other words, segregation occurs here, not among the cells of the diploid generation, but at the moment of formation of the individuals of the haploid generation.

In the ovules of *Stizolobium* crosses I have shown that there is a random segregation of aborted and normal embryo-sacs; and this agrees with the observations of Geerts on the functional megaspores of *O. lamarckiana.* If somatic segregation occurred, there would be a segregation of whole ovaries or parts of ovaries with ovules all aborted or all normal, causing a distribution which would differ markedly from the binomial distribution demanded by a random segregation according to the law of chance. I have shown that with lots of *n* ovules each, the distribution of the aborted and normal ovules corresponds to the binomial $(1+1)^n$. Hence segregation can not have taken place before the formation of the nucellus of the ovule.

In many species and varieties of *Citrus,* as Strasburger (7) and Osawa (4) have proved (and as I can confirm), embryos are formed from the tissue of the nucellus adjacent to the embryo-sac. I have also shown (1), as Strasburger suspected, that a similar mode of formation prevails in certain varieties of *Mangifera indica.* In F_1 hybrids between certain *Citrus* species (8), these adventive embryos do not show segregation; and the adventive embryos of a mango variety give plants nearly constant to that variety. Hence segregation had not taken place when the cells surrounding the megaspore-mother-cell were formed.[1] The same conclusion follows on the work of Ostenfeld (5) and Rosenberg (6) with certain *Hieracia.*

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[1] Somatic segregation is not the only available hypothesis in the cases of the double Matthiola and Petunia. For the double stock *may* have one half or less of its pollen-grains ineffective for fertilization (compare Correns on the pollination of *Mirabilis jalapa,* in *Ber. Deutsch. Bot. Ges.,* Bd. 18, S. 422–435); and in the petunia doubleness *may* be incompletely dominant, as in the greenhouse carnation.